Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Aeronet Global Communications Inc.'s Petition for Rulemaking to Amend The Commission's Allocation and Service Rules For the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands to Authorize Aviation Scheduled Dynamic Datalinks	)	RM-11824
Aeronet Global Communications Inc.'s Petition for Rulemaking to Amend The Commission's Allocation and Service Rules For the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands to Authorize Maritime Scheduled Dynamic Datalinks	)	RM-11825

REPLY TO COMMENTS AND OPPOSITION OF AERONET GLOBAL COMMUNICATIONS INC.

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REPLY TO COMMENTS AND OPPOSITION OF AERONET GLOBAL COMMUNICATIONS INC.

Pursuant to Section 1.405(b) of the Commission's rules,[1] Aeronet Global Communications Inc. hereby replies to the comments of Loon LLC ("Loon"),[2] WorldVu Satellites Limited ("OneWeb"),[3] Elefante Group., Inc. ("Elefante"),[4] and Sierra Nevada Corporation ("SNC"),[5] and the opposition of T-Mobile USA, Inc. ("T-Mobile")[6] (collectively, the "commenters"), regarding Aeronet's petitions in the above-referenced dockets.

[1] 47 C.F.R. § 1.405(b).

[2] Comments of Loon LLC, RM-11824 & RM-11825 (Mar. 11, 2019) ("*Loon Comments*").

[3] Comments of WorldVu Satellites Limited, RM-11824 & RM-11825 (Mar. 11, 2019) ("*OneWeb Comments*").

[4] Consolidated Comments of Elefante Group, Inc. on the Aeronet Petitions, RM-11824 & RM-11825 (Mar. 11, 2019) ("*Elefante Comments*").

[5] Comments of Sierra Nevada Corporation, RM-11824 & RM-11825 (Mar. 11, 2019) ("*SNC Comments*").

[6] Opposition of T-Mobile USA, Inc., RM-11824 & RM-11825 (Mar. 11, 2019) ("*T-Mobile Opposition*").

INTRODUCTION AND EXECUTIVE SUMMARY

Aeronet has petitioned the Commission to adopt minor amendments to the allocation and service rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz spectrum bands (collectively, the "E-Band") to authorize Aeronet's planned use of this spectrum to provide Gigabit per second ("Gbps") broadband to aircraft in flight and ships at sea.[7] As explained in its petitions, Aeronet has developed an innovative datalink technology—scheduled dynamic datalinks ("SDDLs")—that allows it to establish point-to-point networks that include endpoints in motion, using narrow-beam spectrum. This technology will deliver myriad public interest benefits for consumers, carriers, and others. No commenter has disputed that these benefits are substantial and unique.

Several commenters offer support for Aeronet's petitions or indicate their willingness to work with Aeronet to achieve the full potential of the E-Band.[8] As Loon explains, Aeronet's "proposed E-Band rule modifications will result in significant consumer and public interest benefits" by "unlocking the 'Internet of the Sky' and the . . . 'Seas.'"[9]

Those comments opposing Aeronet's petitions appear to misunderstand the framework established by the E-Band rules. T-Mobile, SNC, and, to a lesser extent, Elefante, start from the premise that Aeronet is required to demonstrate that its operations will not cause any interference with their future planned and hypothetical operations. But Aeronet is not requesting blanket authorization to operate throughout the E-Band, across the United States; the targeted rule changes would allow Aeronet to operate in the E-Band, *subject to the E-Band framework, including its technical restrictions and frequency coordination procedures*. While the characteristics of the E-

[7] *See* Petition for Rulemaking of Aeronet Global Communications Inc., RM-11824 (Feb. 6, 2019) ("*Aviation Petition*"); Petition for Rulemaking of Aeronet Global Communications Inc., RM-11825 (Feb. 6, 2019) ("*Maritime Petition*").

[8] *See Loon Comments* at 2-4; *OneWeb Comments* at 2-3.

[9] *See Loon Comments* at 2, 4.

Band make interference unlikely, there is no basis for requiring Aeronet to demonstrate the categorical absence of interference as a precondition to granting its petitions. The rules for the E-Band establish that interference must be addressed on a link-by-link basis, through coordination by independent database managers—a process that Aeronet can and will follow. If it becomes clear to the Commission that other new users and uses of the E-Band require dynamic coordination, Aeronet will work with the Commission and others to develop such processes. But until that time, the Commission should allow Aeronet to begin operations under the existing rules.

Commenters who claim that Aeronet's petitions are missing necessary detail similarly miss the mark. Other E-Band rules, which Aeronet is not proposing to change, answer many of the questions raised by these commenters, and allow the Commission and others to perform preliminary compatibility analyses. In all respects except those identified in its petitions, Aeronet will be indistinguishable from current E-Band users.

Finally, the Commission should act now. The E-Band is subject to a light-touch licensing regime in countries around the world, and there is an exciting opportunity for regulatory leadership to open this spectrum up for innovative operations that deliver true broadband connectivity to aircraft in flight and ships at sea. The Commission should not squander this opportunity or allow a foreign regulator to lock in first-mover advantages from developing a licensing regime for these markets. Moreover, there is no cause for delay—either because there are other technologies that might someday use this spectrum or because there are other dockets that implicate it. Aeronet's SDDLs have already been proven in live trials; Aeronet is planning wider deployment in other jurisdictions; and the Commission has an ample record to move forward quickly.

I. Granting Aeronet's Petitions Will Unleash Significant Public Interest Benefits.

As Aeronet explained in its petitions, the aviation and maritime markets are currently under-served by broadband providers, depriving passengers, carriers, crew, and others of

meaningful connectivity. Granting the instant petitions would open up these markets, encouraging innovation and competition. Unsurprisingly, none of the commenters have challenged the facts that these benefits are substantial and that they will not otherwise be fully realized.[10] The Commission should not lose sight of these facts as it considers the concerns of the commenters.

II. Aeronet's Requested Rule Changes Would Not Alter the Fundamental E-Band Framework, Which Addresses the Interference and Compatibility Concerns Raised by the Commenters.

As explained in the petitions, the Commission can authorize the use of aviation and maritime SDDLs by adopting minor modifications to its Part 101 rules. Specifically, Aeronet has requested that the Commission (1) adopt four new definitions; (2) provide a modest adjustment in maximum allowable EIRP for mobile operations in the 70 GHz and 80 GHz bands; (3) add a clarifying footnote to the Part 101 Frequency Assignments table; and (4) include aviation and maritime SDDLs in the list of permissible operations for the E-Band.[11] Otherwise, Aeronet's operations will comply fully with the E-Band's current service and allocation rules.

Some commenters appear to misapprehend this critical point, which addresses their primary concerns—the risk of interference and the purported lack of technical and operational detail in the petitions. First, while Aeronet is confident that the characteristics of the E-Band make interference unlikely, the Commission's rules do not require that a new licensee categorically avoid all other users throughout the Band and throughout the United States as a precondition to operations. Instead, each licensee is subject to independent, third-party coordination of individual

[10] *See Loon Comments* at 2 (supporting Aeronet for delivering "myriad consumer and public interest benefits"); *OneWeb Comments* at 1 (agreeing that Aeronet's technology has the "potential to facilitate competition in the delivery of next-generation connectivity services to U.S. consumers"); *T-Mobile Comments* at 5 (acknowledging the additional consumer demand for in-air and at-sea connectivity).

[11] *See Aviation Petition* at 28-29; *Maritime Petition* at 26-27.

links to avoid interference.[12] As explained below, Aeronet can and will adhere to these processes. Second, Aeronet's petitions provide enough information, when read in conjunction with the current service and allocation rules, for the Commission and others to perform preliminary compatibility analyses.

A. Commenters' Concerns That Aeronet's SDDLs Are Not Sufficiently Predictable Are Misplaced.

As explained in its petitions, Aeronet has developed an innovative datalink technology that allows it to create, reconfigure, and maintain, in real time, networks involving narrow-beam point-to-point datalinks.[13] These networks will include fixed points, like ground stations and relays, as well as moving points, such as aircraft in flight and ships at sea. Individual data traffic exchange can occur between a ground station and an aircraft (ground to air and air to ground), between aircraft (air to air), from a ground station to a ship (including via relay), and from ship to ship.[14] The dynamic nature of its networks allows Aeronet to deliver dedicated backhaul to each aircraft or ship, based on, among other things, predictable and known travel paths and local conditions.[15] Despite the fact that the aircraft and ships in Aeronet's networks will be in motion, this service can be treated as "fixed," based on similar reasoning to that of the Commission's ESIM precedent.[16]

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[12] 47 C.F.R. § 101.1523; *see also infra* notes 33-35 and accompanying text.

[13] *Aviation Petition* at 13; *Maritime Petition* at 11.

[14] *Aviation Petition* at 13; *Maritime Petition* at 12.

[15] *Aviation Petition* at 9-10; *Maritime Petition* at 14. The Federal Aviation Administration has mandated that aircraft operating in most controlled U.S. airspace be equipped with Automatic Dependent Surveillance-Broadcast ("ADS-B") by January 1, 2020. Information transmitted from ADS-B is an illustration of readily available travel path information.

[16] Elefante has suggested that this analogy "may not hold," *Elefante Comments* at 6 n.14, noting that an aircraft is less likely to "appear" fixed to an Aeronet ground station than it is to a GSO space station, given the admittedly vastly different distances at issue in the SDDL and ESIM contexts. But it was not the lack of "appear[ance]" of movement that justified the Commission's ESIM actions; it was the fact that in operational respects, a moving earth station was not materially different from a stationary earth station. As explained above, the same logic applies here. For its part, SNC calls the analogy misplaced, noting that the Commission's ESIM rules "stem from years of discussion, study, and comments that took place at the International Telecommunications Union," whereas here, "there have been no

Elefante expresses concern that Aeronet's aviation SDDLs will not be between fully predictable paths because "planes may be rerouted to avoid storms and for other reasons," including delays, "not known at the time of 'coordination' with existing operators."[17] SNC echoes this, describing Aeronet's transmission as "unpredictable" and "omni-directional."[18] These concerns are misplaced. As discussed in its petitions and below, Aeronet will establish and coordinate transmissions within sub-mesh networks *that are spatially limited*.[19] Thus, while transmissions within a network may travel in different directions, they are not unpredictable: They will remain within pre-registered networks. Moreover, as Aeronet has explained, if an aircraft or ship were to deviate from its known path in a way that takes it outside of a registered SDDL, the ground station would recognize the deviation in real time and discontinue connectivity until the aircraft or ship returned into the spatial area of a registered SDDL.[20]

SNC likewise misses the mark when it states that "aircraft would need to be tracked by . . . ground stations over wide expanses of their routes."[21] Over the course of a flight, an aircraft might be connected via SDDLs to one or more ground stations or to one or more aircraft, depending on

such studies done." *SNC Comments* at 5-6. But this argument overlooks the fact that, for nearly two decades, the E-Band has been subject to light-license regulation to encourage flexibility and innovation—an approach that has been adopted by regulators around the world. There is thus no need for the Commission to follow the same *process* that it did prior to its ESIM decisions before adopting similar reasoning here. SNC also argues that the ESIM precedent is unavailing because the Part 101 frequency coordination process is not "designed to manage high power transmission to multiple moving end points," *SNC Comments* at 6—an argument that is addressed below in Part II.C.

[17] *Elefante Comments* at 6 n.14.

[18] *SNC Comments* at 7.

[19] As discussed below, spatial limitations will vary slightly, depending on SDDL configuration. *See infra* Part II.C.

[20] *Aviation Petition* at 14; *Maritime Petition* at 13.

[21] *SNC Comments* at 7.

the aircraft's location, weather and topographical conditions, and proximity to other users of spectrum—and subject to interference coordination, as discussed below.[22]

While the instant petitions request specific rule changes to authorize Aeronet to operate SDDLs, Aeronet is not opposed to Loon's request that the Commission "uniformly apply *all* proposed rule modifications to *all* users of the E-Band."[23] Aeronet supports the Commission's clarifying that other users in the E-Band may establish functionally equivalent datalinks involving points in motion, so long as they follow stable and predictable patterns of movement, subject to interference coordination.[24]

B. No Commenter Disputes That the Characteristics of the E-Band Reduce the Risk of Interference Between Users and Uses.

The E-Band is uniquely suitable for Aeronet's SDDLs, given its directionality, narrow-beam width, and signal attenuation, as well as the large bandwidth that is available and largely uncongested.[25] No commenter disputes that these characteristics support spectrum sharing between incumbents and new users. Indeed, as stated succinctly by Elefante, the "characteristics of the 70/80 GHz Bands . . . generally provide a starting point for compatibility in these frequency ranges with fixed services."[26]

While several commenters hypothesize scenarios where Aeronet SDDLs might overlap with their future planned or hypothetical operations, these concerns overlook the independent

[22] Aeronet also notes that incumbent link registrations across the United States remains low, and vast swaths of the country can be covered without any risk of overlapping with another use or user. *See Aviation Petition* at 22, Fig. 4.

[23] *Loon Comments* at 3.

[24] Aeronet also does not oppose Loon's request that the altitude limits be extended to ensure that Loon and High Altitude Platform Systems may operate in the E-Band under modified rules and corresponding coordination processes. *See Loon Comments* at 4.

[25] *Aviation Petition* at 19-24; *Maritime Petition* at 17-22.

[26] *Elefante Comments* at 5-6.

coordination options for *spatial separation, angular separation, polarization assignment*, and *band segmentation* of uses and users.

With respect to spatial separation, as Aeronet explained in its petitions, the 12.9 GHz of spectrum in the E-Band is largely uncongested because incumbent link user volume remains low.[27] While several commenters have expressed interest in using this spectrum, the amount of bandwidth that is currently unused throughout the majority of the United States provides ample room for Aeronet's networks to coexist with others. This will remain the case as the mobile industry moves toward 5G. As a threshold matter, there are a variety of solutions for 5G backhaul—including fiber as well as other millimeter-wave bands—making it unlikely that the E-Band will somehow be essential for this purpose. But even assuming that *some* carriers will utilize E-Band spectrum in *some* locations for *some* 5G backhaul at *some* point in the future, there is no reason to suspect that these fixed terrestrial links, which likely will be predominately located near dense urban centers, will cross with Aeronet's operations, which will generally be located away from these areas.[28]

In addition to being spatial separated, uses and users can be coordinated through angular separation, polarization assignment, and band segmentation. First, the narrow-width beams (*e.g.*, ≤ 1.2 degrees for 70/80 GHz bands)—sometimes referred to as "pencil beams"—as well as rapid roll-off of signal strength outside the main beam, facilitate angular separation in both the horizontal

[27] For example, based on Aeronet's analysis, there are currently only 1,855 registered antennas that have an elevation angle greater than 5 degrees—less than 5 percent of all currently registered link antennas in the E-Band.

[28] *Aviation Petition* at 22-24; *Maritime Petition* at 20-22. Elefante correctly notes that many ports are inland and surrounded by metropolitan areas and that ferries often operate near major urban areas. *See Elefante Comments* at 7. While certainly true, these facts are unrelated to the question at issue. At most, Elefante has demonstrated that Aeronet may have more difficulty registering links for maritime SDDLs for certain urban ports and ferry systems—not that Aeronet should be prohibited from using the E-Band to operate SDDLs where links can be registered and coordinated successfully.

and vertical directions. Second, these beams can be separated by choosing different polarization patterns.[29] And finally, the 70 GHz and 80 GHz bands have been segmented into eight building blocks of 1.25 GHz.[30] The Commission made clear when it adopted this segmentation plan that it was not "mandating specific channels within the segment," nor was it adopting any "aggregation limit"; the Commission's express goal was to provide "flexibility for licensees to choose how much spectrum to use, thus . . . making it possible for more than one provider to use different segments of the band, should more than one provider need to use the same microwave path to reach the same segment of the population."[31] Thus, while it would be incompatible with the current regime for the Commission to restrict Aeronet to only certain segments for certain operations, the availability of multiple coordination mechanisms ensures that interference can be avoided even where users need the E-Band in the same area.

C. Commenters' Interference Concerns Are Addressed by Existing E-Band Rules and Processes.

As Aeronet has explained, its SDDLs would be subject to interference coordination through existing link registration processes.[32] Under the E-Band rules, "[t]hird-party database managers maintain a database of all registered links for the purpose of interference protection and establishing first-in-time rights," using a "'green light/yellow light' mechanism."[33] "[W]hen registering a point-to-point link, licensees are required to submit an interference analysis to the

[29] *See* 47 C.F.R. § 101.117.

[30] *See In re Allocations and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHZ Bands*, Report and Order, 18 FCC Rcd 23,318, 23,332 ¶ 32 (2003) ("Specifically, we will segment the 71-76 GHz and 81-86 GHz bands . . . in[to] building blocks of 1.25 GHz increments").

[31] *Id.* at 23,333 ¶ 32.

[32] *Aviation Petition* at 29-30; *Maritime Petition* at 28.

[33] *In re Spectrum Horizons Battelle Memorial Institute Petition for Rulemaking To Adopt Fixed Service Rules in the 102-109.5 GHZ Band*, Notice of Proposed Rulemaking and Order, 33 FCC Rcd 2438, 2452 ¶ 29 (2018).

database manager that demonstrates that the proposed link will neither cause nor receive harmful interference relative to previously registered non-federal links."[34]

Critically, this process requires a licensee to provide a detailed interference analysis in connection with a *specific link* registration to a *database manager*. Aeronet has validated this process for multiple hypothetical SDDLs. Yet Elefante, T-Mobile, and SNC seek to require Aeronet to provide a detailed interference analysis *now* to establish the categorical avoidance of interference throughout the E-Band, throughout the United States, prior to registering a single link.[35] Thus, it is the comments, not the petitions, that would effectively transform the E-Band—from a light-touch regime that encourages innovative and shared uses into what is practically an exclusive-license regime.

SNC is the sole commenter who raises the question of whether coordination databases can handle the registration of E-Band links involving "multiple moving end points."[36] To be sure, there may be different coordination issues that arise from different SDDL configurations (*e.g.*, ground to air, air to air, or ground (to relay) to sea). But in each case, Aeronet would not be able to register a link without an analysis showing that there will be no interference with incumbent link holders, which an independent frequency coordinator would have to find persuasive. Thus, even after the Commission grants the petitions, it will be Aeronet, and not incumbents and other users, bearing the risk that a database might not accept registrations for certain SDDLs or certain

[34] *Id.* at 2452-53 ¶ 30.

[35] *See Elefante Comments* at 8 (urging the Commission to require Aeronet to provide "details of its technologies and proposed operations to allow for evaluation of interference potential"); *T-Mobile Opposition* at 5 (suggesting that the Commission require "Aeronet to provide technical support for its interference claims" that "take into account how the bands could also support other uses"); *SNC Comments* at 1-2, 4-5 (stating that "Aeronet has not demonstrated that its proposed system can operate without causing interference to other users" and arguing that "Aeronet's proposal lacks technical support for its claims that its systems can successfully co-exist with other users").

[36] *SNC Comments* at 6.

types of SDDLs because those moving end points are not amenable to coordination. In short, the Commission can and should grant the petitions, confident that any interference between an Aeronet SDDL and an incumbent user or a future use can be avoided through existing coordination processes.

Aeronet also understands that as innovation in the E-Band continues, the Commission may determine it is necessary to introduce dynamic, temporal separation as well. Aeronet has previously indicated that its SDDLs would be amenable to coordination through a Spectrum Access System that includes real-time information sharing and spectrum management.[37] Moreover, Aeronet remains willing to work with the Commission as well as others to develop procedures and mechanisms to facilitate even greater spectrum sharing in the E-Band.[38] Aeronet also notes that its petitions do not propose changing the co-primary allocations for the E-Band, which include FSS as well as other services.[39] But the Commission should not delay action on the instant petitions, which will deliver substantial public interest benefits, based on the possibility that new coordination systems might unlock even further innovation in the future. Instead, as

[37] Such dynamic spectrum coordination likely would have been a feature of the Commission's proposed Spectrum Access System in the *Spectrum Frontiers Notice of Proposed Rulemaking*, 31 FCC Rcd 8014, 8165 ¶ 440 (2016). As Aeronet, has previously explained, SDDLs would be amenable to such coordination. *See Aviation Petition* at 30 n.64; *Maritime Petition* at 28 n.60.

[38] The Commission should not, however, propose or adopt new rules "ensuring that any proposed new service allocations do not cause interference to *planned* FSS operations" in the E-Band. *OneWeb Comments* at 3 (emphasis added). As Aeronet has explained, no user should be permitted to monopolize the E-Band, and that is especially true for prospective users. *See* Reply Comments of Aeronet Global Communications Inc., IBFS File Nos. SAT-LOI-20170301-00031, SAT-AMD-20180104-00004 (Sept. 12, 2018).

[39] *See, e.g.*, *In re Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10,988, 11,052 ¶ 196 (2017) ("*Spectrum Frontiers Second Report and Order*"); *see also id.* at 11,052 ¶ 193 & n.519.

explained in Part III, the Commission should act quickly to allow Aeronet to start operating in the E-Band.[40]

D. Aeronet's Petitions Provided Enough Information for Others to Analyze Compatibility Issues.

As Aeronet explained in its petitions, with minor exceptions, aviation and maritime SDDLs are consistent with the existing E-Band rules, which provide numerous technical requirements that would apply to Aeronet's planned operations.[41] It is therefore surprising that some commenters criticized Aeronet for purportedly not providing sufficient technical information to analyze compatibility between SDDLs and future and hypothetical applications in the E-Band.[42] When Aeronet's petitions are read in conjunction with the existing E-Band rules, there is ample information for the Commission and others to perform threshold compatibility analyses—while deferring more detailed analysis to coordination on a link-by-link basis, as discussed in Part II.C, above.

Elefante requests that Aeronet "at a minimum" offer certain additional information regarding its systems.[43] But this information is either already available or unnecessary for present purposes:

- "Details of antenna patterns used for both ground and airborne components of the system": All of Aeronet's antennas will be subject to, and compliant with the Commission's relevant rules, including relating to directional antennas which provide a de facto antenna pattern that can be used for analysis.[44] Aeronet notes that in many

[40] Aeronet acknowledges that SNC has identified unique equities that may merit caution in the 90 GHz Band. To be clear: Aeronet expects that these concerns could be addressed through existing processes. But Aeronet is also not opposed to the Commission's granting the petitions in part, authorizing SDDLS in the 70/80 GHz Bands and deferring action on the 90 GHz Band until Aeronet and SNC can explore mitigation and resolution scenarios. Such an approach would not materially impact Aeronet's short-term deployment and operational plans.

[41] *Aviation Petition* at 28-31; *Maritime Petition* at 26-29.

[42] *See, e.g.*, *Elefante Comments* at 8-9; *SNC Comments* at 6-7.

[43] *See, e.g.*, *Elefante Comments* at 8-9.

[44] 47 C.F.R. § 101.115.

instances, it expects its antenna patterns to exceed the Commission's minimum standards, such as the minimum radiation suppression.

- "Whether Aeronet will use automatic transmit power control mechanisms": As explained in its petitions, Aeronet will employ automatic power control, which will ensure that the system uses only enough power to close the link, rather than always using the maximum power.[45]

- "The directions in which Aeronet intends to use different sub-bands of the E-Band (e.g., ground-to-aircraft, aircraft-to-ground, or aircraft-to-aircraft)": The E-Band rules are inconsistent with restricting users to certain band segments on a categorical basis. Aeronet plans to coordinate each link, working with the frequency coordinator to find segment uses that promote compatibility with other registered systems. Moreover, based on its internal analyses regarding this question, Aeronet anticipates that it may be more agnostic as to E-Band segments than some other types of users. Thus, although it is not required to do so, Aeronet commits to working informally with other parties, outside of formal coordination channels, to prioritize band segments that are less likely to present compatibility concerns.

- "Further information about the limits of operations of SDDLs" including "elevation angle limits or maximum distances over which the links will operate": As noted, under existing E-Band rules, Aeronet would provide necessary information on a link-by-link basis to allow database managers to coordinate registrations to avoid interference. If Aeronet's operations would interfere with an incumbent registration holder in a particular location or on a particular frequency segment, Aeronet would not be able to register or operate the link. Aeronet ground-to-air datalinks will be above a minimum 5 degree elevation angle from the fixed ground station location but could be further restricted at some sites as determined by the frequency coordinator.[46] Link distances will be limited by standard propagation losses, mechanisms to establish the desired link margin at the receiver, and the use of automatic power control, discussed above.

- "How much and what type of location-specific operational information will Aeronet be willing to share with other spectrum users dynamically and in what manner would it be shared": Under existing E-Band rules, licensees are not currently required to engage in dynamic spectrum management. Like other licensees, Aeronet would coordinate its networks through link registration processes. Information required by database managers, including ground station location, power levels, antenna patterns, operational limitations, and so forth, would be publicly available. As noted, however, Aeronet is willing to work with the Commission and others to develop procedures and mechanisms for dynamic sharing if and when the Commission determines that becomes necessary.

[45] *Aviation Petition* at 23 n.42; *Maritime Petition* at 22 n.38.

[46] *Aviation Petition* at 14.

III. The Commission Should Act Quickly to Deliver These Public Interest Benefits and to Facilitate International Harmonization for the E-Band.

As explained in Aeronet's petitions, there is an urgent need for true broadband connectivity on aircraft in flight and ships at sea. There is thus every reason for the Commission to act quickly on these petitions, ensuring U.S. leadership in new broadband markets and encouraging international harmonization of the regulatory framework for the E-Band. Aeronet has already established maritime SDDLs (shore to ship and ship to shore) in two jurisdictions, delivering 1 Gbps uplink and downlink connectivity at sub-30mSec latency, to two ships, carrying 2,000 passengers and crew daily. Aeronet has concrete plans for additional investments in the Caribbean market, with the potential to provide significant benefits to American travelers. And Aeronet has worked constructively with other regulators to obtain the necessary authorizations and licenses for its testing there. Nor is there any reason for the Commission to defer action on these petitions because there are other proceedings that implicate this spectrum in the United States. Aeronet's petitions are "ripe," and the development of the record regarding the E-Band since the *Spectrum Frontiers* proceeding should give the Commission confidence that Aeronet can operate SDDLs under the existing regulatory framework.

A. The Commission Should Not Mortgage the E-Band Based on the Possibility That It Could Be Used for 5G Backhaul or Mobile Services in the Future.

Aeronet appreciates that there are currently several proceedings that include consideration of spectrum in the E-Band. But Aeronet's petitions do not "sidestep" or "circumvent" these proceedings.[47] Aeronet's SDDLs could deliver substantial public interest benefits while complying with the Commission's existing E-Band rules with minor modifications. Thus, during

[47] *T-Mobile Opposition* at 2, 4.

the pendency of these other proceedings, there is no reason to indefinitely mortgage the E-Band, especially to accommodate uses that do not yet exist.

The Commission should consider the instant petitions separate from the Wireless Backhaul proceeding. To be sure, in its *Spectrum Frontiers Second Report and Order*, the Commission elected not to act on several proposals for the E-Band, including Aeronet's, because several proposals were not fully developed and because several other proposals remained pending in the WT 10-153 docket.[48] But the Commission did not state that interested parties were thereby precluded from developing the record in support of targeted changes—while the Commission considered system-wide changes—to the E-Band rules. Indeed, that is exactly what Aviat Networks and CGF Networks have done.[49] Moreover, as explained above, Aeronet's SDDLs would pose little if any interference risks for terrestrial backhaul links used to carry 5G traffic, as Aeronet's infrastructure is unlikely to be deployed near heavy-data urban centers, except in limited circumstances,[50] and where there is spatial overlap, interference can be avoided through existing coordination procedures.[51]

The case for delay is less compelling based on the possibility that the E-Band could be exclusively licensed for mobile services.[52] First, as T-Mobile acknowledges, there is currently no technology that "support[s] mobile applications in these bands."[53] Of course, technology can

[48] *Spectrum Frontiers Second Report and Order*, 32 FCC Rcd at 11,054 ¶ 201.

[49] *T-Mobile Opposition* at 4 (describing support for targeted waivers of rules governing the 70/80 GHz bands to support 5G backhaul while the Wireless Backhaul proceeding moves forward).

[50] *See supra* note 28.

[51] *See supra* Part II.B-C (discussing separation mechanisms and adequacy of existing coordination processes).

[52] *See T-Mobile Opposition* at 5 (stating that Commission must consider all potential uses of the band, including for potential mobile services).

[53] *Id.* at 5 n.14.

evolve quickly, but, in the E-Band, it has been the innovators like Aeronet, Loon, and Elefante that have been driving development and innovation. For example, it was Aeronet that demonstrated that its SDDL technology can achieve 1-3 Gbps connectivity in maritime environments, at distances much longer than previously thought possible,[54] under its existing experimental license.[55]

Second, moving to an exclusive license regime for the E-Band would take years before the spectrum came online. The Commission would have to start a comprehensive new E-Band rulemaking to consider such a dramatic change—which would take substantially longer than the instant petitions to complete. Then, the spectrum would have to be allocated—a process that takes time under any circumstances, and which would presumably have to include a transition plan for federal and incumbent users.[56]

Third, there is no indication that other countries are considering exclusive licensing of this spectrum for mobile services, making it unattractive from an international perspective. In contrast, the Commission can achieve more bang for its buck by leveraging the light-license regime that many countries have adopted for the E-Band.

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[54] *Aviation Petition* at 16; *Maritime Petition* at 14.

[55] *See* Federal Communications Commission, Experimental Radio Construction Permit and License, WJ2XPI, 0272-EX-CN-2018. Likewise, Loon has reported that each of its balloons "can provide service using standard LTE frequencies to terrestrial UEs that cover an area over 5000 square kilometers" and that it can "form links across more than 1000 kilometers using a string of E-band links across 7 balloons." *Loon Comments* at 2.

[56] *Cf. In re Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Fourth Further Notice of Proposed Rulemaking, 33 FCC Rcd 7674, 7674 ¶ 1 (2018) ("Today we seek comment on how best to transition existing spectrum holdings in the 39 GHz band . . . to the new flexible-use band plan, in a manner that will promote efficient use of this spectrum by incumbents and new licensees for fifth-generation (5G) wireless, Internet of Things, and other advanced services."); *In re Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, 33 FCC Rcd 6915, 6939 ¶ 72 (2018) (describing market-based approach involving multiple steps to implement transition plan).

B. Aeronet's Petitions Are "Ripe" and Would Not Prejudice Future Activity in Other Dockets Implicating the E-Band.

Aeronet's petitions should not have come as a surprise to anyone interested in using E-Band spectrum now or in the future. Indeed, Aeronet has been actively participating in relevant proceedings for over three years.[57] And Aeronet's consistent refrain is that its SDDLs do not pose a risk to incumbent users under existing coordination procedures or to new users under a more dynamic spectrum sharing arrangement.[58] Indeed, that is why Aeronet generally has not opposed other parties' requests to use the E-Band in innovative ways; instead, Aeronet has sought to reserve its rights in anticipation of filing the instant petitions.[59] Now, the record is sufficiently developed to allow the Commission to take action.[60]

Moreover, Aeronet commits to following the same approach going forward. The Commission's E-Band rules are intended to promote flexible and shared use of spectrum, and thereby to spur innovation. Aeronet supports this framework. And as expressed in its petitions and here, Aeronet is willing to work constructively with the Commission and all prospective E-Band users to ensure that their innovations can be authorized and operated without foreclosing each other. That is true for future FSS operations, backhaul and feeder links for balloon-powered internet services, terrestrial links carrying 5G traffic, feeder links for Stratospheric-Based Communications Services, or radar-based enhanced flight vision systems. But Aeronet's

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[57] *See, e.g.*, Letter from Ivor Fitzpatrick, Director, to Commission's Secretary, FCC, Docket No. 15-138 (Jan. 26, 2016) (expressing interest in using spectrum bands above 24 GHz).

[58] *See, e.g.*, Letter from Brian Russell, Aeronet to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95 (Oct. 5, 2017).

[59] *See* Reply Comments of Aeronet Global Communications Inc., IBFS File Nos. SAT-LOI-20170301-00031, SAT-AMD-20180104-00004 (Sept. 12, 2018); Comments of Aeronet Global Communications Inc., RM-11809 (July 11, 2018).

[60] As explained in Aeronet's petitions, with the filing of proposals from Elefante, OneWeb, and Aeronet, the primary condition for moving forward in *Spectrum Frontiers* has been satisfied. *See Aviation Petition* at 26-27; *Maritime Petition* at 24-25.

technology is ready, and there is no record-based need to defer action on these petitions until such efforts are completed.

CONCLUSION

For the foregoing reasons and as explained in Aeronet's petitions, the Commission should grant the petitions.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I, Elliot S. Tarloff, hereby certify that on March 26, 2019, a copy of the foregoing Reply to Comments and Opposition of Aeronet Global Communications Inc. was served by first-class U.S. mail, postage paid, on the following:

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